Schering-Plough
HealthCare Products

1706 '00 AUG 30 A8:02

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August 30, 2000

Dockets Management Branch (HFA-305)
Food and Drug Administration
5630 Fishers Lane
Room 1061
Rockville, MD 20852

RE: Docket 78N-0038: Sunscreen Drug Products for Over the Counter Human Use: Final Monograph, Re-Opening of Administrative Record

The Food and Drug Administration (FDA) has extended the effective date for the final monograph for over-the-counter (OTC) sunscreen drug products and has reopened the administrative record for rulemaking to allow for comment on key technical and labeling issues related to sunscreen products. These issues were outlined by FDA in the June 8, 2000 Federal Register. The FDA intends to publish a comprehensive final monograph on OTC sunscreen drug products by December 31, 2001. The Agency has requested interested parties to provide specific types of data and information which would allow identification and adoption of a standard UVA testing procedure, along with a clear way to present UVA protection information in labeling to consumers.

Contained herein is a proposal developed by an industry group that addresses the key issues relating to the testing and labeling of products that offer UVA protection. This industry group includes manufacturers of sunscreen products designed for use during outdoor activities (e.g. sport and beach use) as well as everyday use (e.g. makeup and foundations). These companies are responsible for the development, manufacture and sale of a majority of the Branded sunscreen-containing products that make SPF and UVA protection label claims. Letters from each individual company supporting this proposal are attached to this document.

Schering-Plough HealthCare Products has been a leader in the development, testing and study of sunscreen products, and has contributed greatly over the years to the development of appropriate sunscreen drug product regulation. We continue to support the promotion of responsible sun safety through our products, their labeling and advertising.

78N-0038

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In response to FDA's request for information and data on UVA testing methods and labeling, Schering-Plough HealthCare Products, along with the aforementioned industry group, has developed the enclosed proposal that includes a comprehensive approach to measuring sunscreen UVA protection and provides clear communication of both SPF and UVA protection to consumers and professionals. The proposal addresses three important issues that have been considered by FDA in an attempt to develop rulemaking involving sunscreen products that claim UVA protection. These are (1) *in vivo* and *in vitro* testing of sunscreen UVA performance, (2) UVB/UVA proportionality for sunscreen products, and (3) communication of UVA performance on sunscreen-containing product labels.

This proposal assures not only proportionality of UVA to UVB protection levels in sunscreen products, but also ensures broadness of absorbance for all products making UVA protection claims. UVA/UVB proportionality is an important concept supported by both the American Academy of Dermatology and the FDA to ensure that sunscreens which offer protection from UVB radiation also offer appropriate and relative protection from UVA radiation, both of which contribute to short- and long-term skin damage. At the October 26, 1999 feedback meeting between the Agency and CTFA, as well as in subsequent written communications, FDA asked industry for specific information on the proportionality needed between SPF and UVA protection. Thus, this proposal also assures that higher SPF products contain proportionally increasing levels of UVA protection as the SPF increases based both on the magnitude and the broadness of UVA protection. The proposed approach also supports communication of the level of UVA protection in a simple, integrated format consistent with existing SPF labeling.

In support of this proposal, we have included the results of testing the UVA efficacy of seven prototype sunscreen formulations with SPFs from 4 to 30, composed of a wide variety of active ingredients. We, along with the other companies whose letters are supplied with this submission, support the testing and labeling proposals provided in these documents and hope that this information will assist your completion of a comprehensive final monograph.

Previously, the Cosmetic, Toiletry and Fragrance Association (CTFA) submitted comments addressing FDA questions and issues relating to the testing and labeling of sunscreen products, specifically Sun Protection Factor (SPF) testing and labeling. Importantly, those comments addressed the issue of labeling products with SPF greater than 30, along with additional sunscreen indications beyond sunburn (e.g. photoaging). Schering-Plough HealthCare Products participated in the development of those comments and, not withstanding the proposal herein, strongly supports those earlier submissions on SPF testing and labeling.

Should the Agency have any questions or comments on the information contained in this submission, please direct them to the undersigned.

Sincerely,

Mark Gelbart DF

Mark B. Gelbert, PhD, JD
Vice President, Scientific Affairs
Schering-Plough HealthCare Products Inc.

Desk Copies: Dr. Ganley
Dr. Wilkin
Dr. Katz
Mr. Lipnicki

Bath & Body Works

August 30, 2000

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Enclosed is a proposal for testing sunscreen products for Ultraviolet A (UVA) efficacy and also for labeling the UVA protection provided by these products. This proposal identifies a way to evaluate UVA protection based on the concepts of proportionality and quantitative measurement of efficacy, providing the basis for clear communication of protection to consumers. In support of this proposal, we have included the results of testing the UVA efficacy of seven prototype sunscreen formulations with SPFs from 4 to 30, composed of a wide variety of active ingredients.

These data illustrate that proportional UVA protection cannot be guaranteed solely by measuring the broadness of absorbance; a measurement of the magnitude of protection is also required to fully and accurately describe the protection provided. This conclusion is consistent with the opinion of the American Academy of Dermatology, who have recommended that an increase in the SPF of a sunscreen must be accompanied by proportional increase in the UVA protection values, and that these "proportional" values should be determined by the FDA and the industry.

7 Limited Parkway East, Reynoldsburg, OH 43068
614 856 6000

The proposal presented in this document offers a way to create a comprehensive approach to sun protection which assures not only proportionality of UVA to UVB protection levels but also ensures breadth of absorbance for products making UVA protection claims. More importantly, in light of concerns expressed by the Agency that high SPF products may increase sun exposure and consequently UVA exposure, this proposal also ensures that high SPF products contain proportionally increased levels of UVA protection, coinciding with the view expressed by the American Academy of Dermatology. This approach also supports communication of the level of UVA protection in a simple, integrated format consistent with existing SPF labeling.

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Sincerely,

John P. Tedeschi
Director of Product Safety

cc: J. Grieve
G. Kort
G. Ziets

Estée Lauder Companies
Research Park
125 Pinelawn Road
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August 30, 2000

ESTĒE LAUDER COMPANIES

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Sincerely,

Harvey Gedeon
Sr. Vice President
Research and Development

Johnson & Johnson
CONSUMER FRANCHISES WORLDWIDE

August 30, 2000

WILLIAM C. EGAN
GROUP FRANCHISE CHAIRMAN
CONSUMER PRODUCTS WORLDWIDE

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Sincerely,

William C. Egan

199 GRANDVIEW ROAD SKILLMAN, NJ 08558-9418

L'ORÉAL
USA

August 30, 2000

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Food and Drug Administration
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The proposal presented in this document offers a way to create a comprehensive approach to sun protection which assures not only proportionality of UVA to UVB protection levels but also ensures breadth of absorbance for products making UVA protection claims. More importantly, in light of concerns expressed by the Agency that high SPF products may increase sun exposure and consequently UVA exposure, this proposal also ensures that high SPF products contain proportionally increased levels of UVA protection, coinciding with the view expressed by the American Academy of Dermatology. This approach also supports communication of the level of UVA protection in a simple, integrated format consistent with existing SPF labeling.

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Sincerely,

A. J Penicnak /cms

A. John Penicnak, Ph.D.
Senior Vice President, Corporate Scientific
L'ORÉAL USA Products, Inc.

cc: J. Sullivan, General Counsel, L'ORÉAL USA, Inc.

August 30, 2000

MARY KAY®

Dockets Management Branch (HFA-305)
Food and Drug Administration
5630 Fishers Lane
Room 1061
Rockville, MD 20852

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Sincerely,

Carolyn B. Wills
Manager, Regulatory Affairs & Compliance

Mary Kay Inc.
Research and Development Division
1330 Regal Row
Dallas, TX 75247

Balancing UVA and UVB Protection: Proportionality, Quantitative Measurement of Efficacy, and Clear Communication to Consumers

8/30/00

Balancing UVA and UVB Protection: Proportionality, Quantitative Measurement of Efficacy, and Clear Communication to Consumers

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Balancing UVA and UVB Protection: Proportionality, Quantitative Measurement of Efficacy, and Clear Communication to Consumers

Executive Summary

The Food and Drug Administration (FDA) has extended the effective date for the final monograph for over-the-counter (OTC) sunscreen drug products and has reopened the administrative record for rulemaking to allow for comment on key technical and labeling issues related to sunscreen products. These issues were outlined by FDA in the June 8, 2000 Federal Register. The FDA intends to publish a comprehensive final monograph on OTC sunscreen drug products by December 31, 2001.

Contained herein is a proposal developed by an industry group that addresses the key issues relating to the testing and labeling of products that offer UVA protection. This industry group includes manufacturers of sunscreen products designed for use during outdoor activities (e.g. sport and beach use) as well as everyday use (e.g. makeup and foundations). The following companies have contributed to and strongly support this proposal on UVA testing and labeling:

Bath & Body Works, Inc.
Estee Lauder Companies
Johnson & Johnson Consumer Franchises WorldWide
LORÉAL USA Products, Inc.
Mary Kay, Inc.
Schering-Plough HealthCare Products, Inc.

These companies are responsible for the development, manufacture and sale of a majority of Branded sunscreen-containing products that make SPF and UVA protection label claims.

Previously, the Cosmetic, Toiletry and Fragrance Association (CTFA) submitted comments addressing FDA questions and issues relating to the testing and labeling of sunscreen products offering UVB protection, specifically Sun Protection Factor (SPF) testing and labeling. Importantly, those comments addressed the issue of labeling products with SPF greater than 30, along with additional sunscreen indications beyond sunburn (e.g. photoaging). The industry group, made up of the companies above, participated in the development of those comments and, not withstanding the proposal herein, strongly supports those earlier submissions.

In response to FDA's request for information on UVA testing methods and labeling, the industry group above has developed a proposal that includes a comprehensive approach to measuring sunscreen UVA protection and providing clear communication of both SPF and UVA protection to consumers and professionals. The proposal addresses three important issues that have been considered by FDA in an attempt to develop rulemaking involving sunscreen products that claim UVA protection. These are (1) *in vivo* and *in*

vitro testing of sunscreen UVA performance, (2) UVB/UVA proportionality for sunscreen products, and (3) communication of UVA performance on sunscreen-containing product labels.

This proposal assures not only proportionality of UVA to SPF protection levels in sunscreen products, but also ensures broadness of absorbance for all products making UVA protection claims. UVA/UVB proportionality is an important concept supported by both the American Academy of Dermatology and the FDA to ensure that sunscreens which offer protection from UVB radiation also offer appropriate and relative protection from UVA radiation, both of which contribute to short- and long-term skin damage. Thus, this proposal also assures that higher SPF products contain proportionally increasing levels of UVA protection as the SPF increases, based both on the magnitude and the broadness of UVA protection. This coincides with the views expressed by the American Academy of Dermatology. The proposed approach also supports communication of the level of UVA protection in a simple, integrated format consistent with existing SPF labeling.

In summary, this proposal makes the following specific recommendations on sunscreen testing and labeling:

UVA Testing:

1. An *in vivo* measurement of the "quantity" of UVA protection provided by a product is needed in addition to a measurement of broadness to fully assess product performance in the UVA range. Broadness of absorbance alone does not fully measure UVA protection or describe product performance in the UVA range. This proposal recommends the adoption of the Protection Factor A (PFA) method and/or the Persistent Pigment Darkening (PPD) method for measuring the quantity of UVA protection provided by a sunscreen product. These methods and their capabilities are described herein.

2. In addition to the amplitude of UVA protection, any sunscreen product labeled for UVA protection must demonstrate absorbance to or above 360 nm. This assessment can be accomplished using standard methods.

UVA/UVB Proportionality:

3. UVA protection should increase proportionally with higher SPFs; this can be assured through the use of defined ratios of UVA to SPF protection.

4. Using a sliding scale of minimum UVA efficacy guarantees commensurate UVA protection at each SPF based on a fixed ratio: there is proportional UVA/UVB protection at every SPF. This minimum or "basic" UVA protection should be based on a PFA:SPF ratio of 0.20. Additional UVA protection for products that desire to claim "extra" UVA protection" would require a PFA:SPF ratio of 0.25.

5. Once again, broadness of absorbance is guaranteed for both "basic" and "extra" levels of UVA protection through the requirement that all products that make UVA claims demonstrate absorbance to or above 360 nm.

Sunscreen Labeling:

6. SPF should retain preeminence on the principal display panel, and should continue to be the primary driver of consumer product selection.

7. UVA labeling should also be displayed on the principal display panel in terms of simple text descriptors, using wording that will allow consumers to identify and select a product with the level of SPF and UVA protection that suits their Skin Type and sun protection needs.

8. UVA protection claims should be allowed for sunscreen products with SPFs of 4 and higher.

9. Two distinct categories of UVA protection are warranted. Sunscreen products can be formulated to provide basic, proportional UVA/UVB protection, or to exceed that requirement to provide extra UVA protection for those who want or need additional protection. A higher category of UVA protection assures that products which claim "extra" UVA protection deliver that benefit at each SPF.

10. An example of the information contained on the sunscreen product principal display panel, including UVA protection, would include:

    - SPF
    - UVA (select one of the following, as appropriate)
      - "UVA protection" (i.e., meets minimum requirement for UVA/UVB proportionality and exhibits ≥360 nm absorbance)
      - "Extra UVA protection" (i.e., exceeds minimum requirement for proportional UVA/UVB protection; exhibits absorbance ≥ 360 nm)

11. Professional labeling can be provided to physicians that will allow them to select or recommend sunscreen products for their patients' needs, based on more detailed information describing the quantity (protection factor) and the broadness of protection.

This industry group respectfully submits these recommendations and the supporting detail provided herein and strongly recommends that they be incorporated into the comprehensive final monograph on OTC sunscreen drug products anticipated to publish by December 31, 2001.

Balancing UVA and UVB Protection: Proportionality, Quantitative Measurement of Efficacy, and Clear Communication to Consumers

Introduction

In 1996, industry (via CTFA) submitted to FDA an in vitro UVA test method called Critical Wavelength (1). That method measured the broadness of the protection provided by a sunscreen product, but did not address either the magnitude of protection or the issue of the appropriate proportionality of UVA to UVB protection. The importance of assessing the quantity of UVA protection provided by sunscreen products was highlighted by the Agency in correspondence relating to Citizen Petition 8, docket 78N-0038 (2,3). In that correspondence, the Agency asked for additional UVA protection data beyond Critical Wavelength to support the UVA efficacy of certain combinations of sunscreen active ingredients with avobenzone. The data that the Agency requested was to be based on the in vivo Protection Factor A (PFA) test method (4).

The importance of proportionality was raised at the October 26, 1999 feedback meeting between CTFA and the Agency. At that meeting, FDA asked industry to comment on the requirement for proportionality between the SPF and UVA protection. The request for information on this point was made again in the FDA letter to CTFA of March 20, 2000. The importance of the proportionality of UVA to UVB was also addressed by the American Academy of Dermatology (5) in their April 26, 2000 press statement on UVA:

> "The AAD recommends that an increase in the SPF of a sunscreen must be accompanied by a proportional increase in the UVA protection value. These "proportional" values should be determined jointly by the FDA and the industry."

The final element that must be considered for a comprehensive approach to sun protection is the clear communication of both SPF and UVA protection information. The American Academy of Dermatology has recommended maintaining the SPF as the primary indicator of overall sunscreen performance. In 1996, CTFA submitted market research to the Agency (6) that showed that the best way to communicate UVA protection to the consumer was in the form of simple text descriptors, as opposed to utilizing additional numbers or graphics on the package label. This finding continues to be important, and is consistent with the concept of maintaining the SPF as the primary indicator of the protection provided by the sunscreen product.

In the Federal Register notice of June 8, 2000 (7), the Agency asked for industry input concerning professional labeling and, in particular, what information that labeling might contain. Based on adoption of the proposal herein, voluntary professional labeling information could provide details beyond those needed for consumer labeling concerning the quantity and broadness of the UVA protection offered by a product, along with information on other product performance characteristics that might be pertinent only to physicians. This information would allow physicians to recommend sunscreen products for specific needs and conditions, based on individual evaluation of their patients. However, such professional labeling cannot take the place of clear and comprehensible information on the label for consumers.

The proposal presented in this document offers a way to create a comprehensive approach to sun protection which assures not only proportionality of UVA to UVB protection levels but also ensures breadth of absorbance for products making UVA protection claims. More importantly, in light of concerns expressed by the Agency that high SPF products may increase sun exposure and consequently UVA exposure, this proposal also ensures that high SPF products contain proportionally increased levels of UVA protection, coinciding with the view expressed by the American Academy of Dermatology above. This approach also supports communication of the level of UVA protection in a simple, integrated format consistent with existing SPF labeling.

Background on the Requirements for UVA/UVB Proportionality

The primary use of sunscreen products is to prevent sunburn and other forms of UV damage to skin. According to Urbach (8), the ratio of damage from the UVB and UVA components in sunlight over a day is 80% UVB and 20% UVA. Of the 20% due to UVA (320-400 nm), 62% of the damage risk has been ascribed to the shorter UVA II wavelengths (320-340 nm). Diffey (9) and Cole (23) have described a similar relationship of UVB to UVA (4B: 1A ratio) for UV-induced biological effects on the skin. Therefore, to provide proportional protection against both UVA and UVB, a sunscreen must protect against the 80/20 ratio of UVB and UVA in incident sunlight.

The overall SPF is a composite of the UV protection provided by the sunscreen product in both the UVB and UVA. The biological response of the skin to sunlight can be expressed as $MED = MED_B + MED_A$, where one Minimal Erythemal Dose (MED) is composed of the contribution to sunburn from both the UVB and UVA wavelengths present in sunlight at any point in time. Using the 4:1 UVB: UVA relationship above, we can calculate the minimum UVA blockage needed to provide UVA/UVB protection for any SPF level. Table 1 describes the number of MEDs resulting from UVB radiation and UVA radiation reflecting that relationship. This table also illustrates the corresponding UVA blockage needed at each SPF to provide minimum protection in the UVA against sunburn and other forms of UVA induced damage based on the 4B: 1A ratio of incident sunlight.

While there are >30 sunburning MEDs per day possible for Fitzpatrick (10) Skin Type I's in the United States, a liberal estimate of the total UVA MEDs available per day is 4-6 UVA MEDs, delivered at a fairly constant rate of 1/2 MED/hr in the summer (11, 12). However, it is shortsighted to consider only the acute effects of either UVA or UVB. Suberythemal doses and chronic doses of UVA as well as UVB have been shown to produce measurable damage in the skin. Therefore, considering only the total number of UVA MEDs available per day may underestimate the ability of UVA to contribute to and exacerbate long-term UVB–induced skin damage, including skin cancer and photoaging.

Action spectra for UV damage to skin are also key elements to be considered in determining a method for confirming the UVA protection provided by sunscreens. If the action spectra for other known forms of damage are compared to the action spectrum for sunburn (Figure 1), it is easy to see why a test method for assessing UVA protection must include the effects of the shorter wave UVA as well as the longer wave UVA. In vivo responses to UVA radiation, which can be measured

in clinical tests using light sources which include only UVA wavelengths (320-400 nm), can be used to substantiate protection across the UVA spectrum (Figures 2A and 2B).

Protection Minimums for Proportional UVA/UVB Protection

Based on Table 1, a PFA of $\geq$2 in the UVA is needed at incident levels of 10 MEDs of sunlight and above. At levels below 10 MEDs, there is not a requirement for a PFA of 2 to prevent erythema from UVA, as the UVA component of erythema is one MED or less at those levels. Nevertheless, it is desirable to incorporate measurable UVA protection at all SPF levels; therefore, a minimum of a PFA of 2 should be a requirement even at low SPF levels for products that claim to protect against UVA as well as UVB.

The UVA wavelengths from 320 to 340 nm have been recognized as wavelengths that can contribute significantly to the development of skin cancer. Studies by Kelfkens et. al. (13) have shown that short-wave UVA (< 340 nm) is 5 times more efficient in producing skin cancer than the longer wavelength UVA. This is important in light of suggestions that the measurement of sunscreen UVA effectiveness be limited only to a description of its longwave UVA protection (i.e., to only its broadness) or that only one "pass-fail" level of UVA protection be recognized.

From an active ingredient perspective, to block the UVA contribution to sunburn and skin cancer, the absorbance of products of SPF 10 and above must extend beyond the UVA II (320-340 nm) to be effective. This is often achieved through the inclusion of oxybenzone or other UVA absorbers. For higher SPF products, the UVA absorbance must extend into the UVA I region, to or above 360 nm, to achieve the UVA/UVB balance needed at those SPF levels. This can be achieved by including combinations of UVA absorbers or by increasing the content of one or more active ingredients as needed. Products which provide proportional UVA/UVB protection should be readily identifiable to consumers, along with those products that include "extra" UVA protection.

Beyond the Minimum Balance Requirements: Extra UVA Protection

Based on today's technologies, products can be created such that more UVA protection is provided at any SPF level than is required from a sunburn protection standpoint. This can be done either to provide extra protection against other forms of potential UVA damage beyond sunburn, or as a consequence of extending the spectrum of absorbance through the inclusion of certain active ingredients which absorb well into the UVA I (i.e., >360 nm). While the action spectrum for photoaging effects appears to be very similar to the action spectrum for sunburn for some biological endpoints such as dermal elastosis (14, 15), there have been other studies which have shown that longwave UVA (> 340 nm) may contribute in different ways to premature skin aging. Studies by Lowe et. al. (16) and Lavker et. al. (17) suggest that repeated exposure to suberythemal doses of UVA may result in long term damage, resulting in increased photoaging of the skin. The regular use of sunscreens with effective UVA and UVB protection may help to protect against these cumulative, long-term forms of skin damage, as well as the more acute effects.

Honigsmann has suggested that a PFA of 3 (67% UVA blocked) be incorporated into every sunscreen product above SPF 10 (18). However, it appears from Table 1 that if only one protection factor was to be set for all UVA claims purposes, it would mandate more UVA protection than is scientifically or medically justifiable in lower SPF products (SPF 2-8), while allowing less UVA protection than is actually needed for adequate UVA protection at SPF's of 12 and above. We propose that the minimum requirement for products that provide "extra UVA protection" should be a PFA of 3. From there, UVA protection that increases as SPF increases can be incorporated into products based on UVA protection factors determined in vivo, in combination with broadness of protection. Broadness of absorbance alone does not guarantee proportionality of UVA to UVB.

Identification and Communication of Two Distinct Levels of UVA Protection

Based on specific ratios of UVA to UVB, categories of UVA protection can be defined to recognize products which provide a basic, proportional UVA/UVB protection, and an "extra UVA protection" level based. Breadth of absorbance (i.e., the product absorbs to or above 360 nm*) could also be determined to ensure that the broadness of protection was appropriate to support a UVA protection claim at any SPF level. This could be measured using the critical wavelength method (1), or by a spectrophotometric assessment of the absorbance spectrum.

The means to ensure UVB/UVA proportionality as SPF rises is shown in Table 2. To determine the level of UVA protection needed at any SPF, the SPF would be multiplied by 0.20. For example, an SPF 20 product would require a PFA of 4 to qualify as a sunscreen providing proportional UVA/UVB protection. Table 2 also illustrates the increased UVA protection that would be required for formulations that would qualify for "extra UVA protection" in comparison to the level of UVA protection present in formulas that exhibit basic, proportional UVA/UVB protection. To qualify for the higher level of claim, a PFA to SPF factor of 0.25 must be reached. An SPF 40 product would require a PFA of 8 for proportional UVA/UVB protection, and a PFA of 10 or more to qualify for "extra" UVA protection labeling.

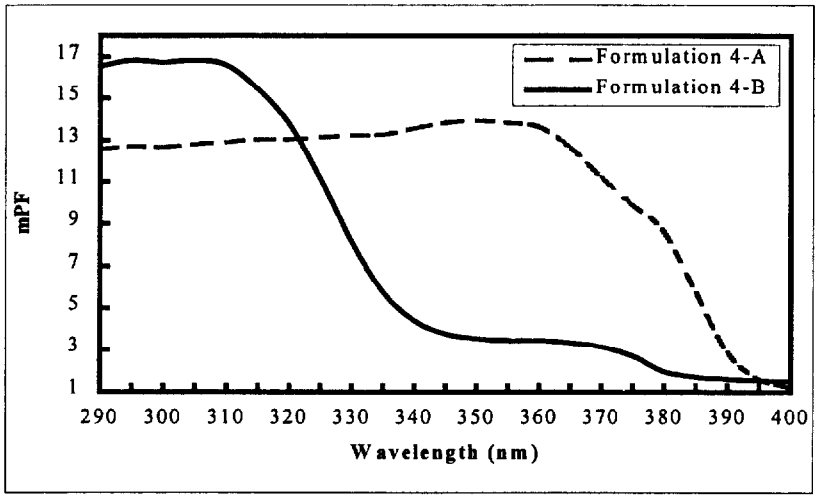
Using the UVB to UVA relationships shown in Table 2, a product could qualify as providing proportional UVA/UVB protection, or could qualify for the "extra UVA protection" claim (for example, for products which include avobenzone). This method of assessing and communicating protection would serve (along with SPF as the primary indicator of product efficacy) to easily identify products which provide the higher level of protection from UVA and UVB, for the most sun sensitive consumers and for dermatology recommendations. It would also serve to allow those who prefer a lower SPF product to identify and select a product based on their Skin Type or needs. Not every consumer will want or need only products with "extra" UVA protection. A selection of affordable, balanced UVA/UVB protection products will continue to remain important, and there should be a readily identifiable UVA claim for the proportional protection that they provide. This proposal would recognize the basic UVA protection provided by products which do not choose to utilize avobenzone or zinc oxide, but which do exhibit good UVA protection nonetheless.

* according to the TFM, p. 28233

The existence of two distinct levels of UVA protection will not only allow consumer choice, but will also challenge industry to strive to meet the higher category by developing new technologies and new types of formulations. The "extra UVA protection" category would present true formulation challenges within the limitations of the active ingredient combinations currently allowed, especially at high SPFs. As future technologies are identified and our knowledge of the effects of UVA progress, this strategy also provides the flexibility to consider higher levels of sun protection, without altering the familiar labeling that consumers will have come to expect on sunscreen products.

The Need to Measure Both Breadth and Quantity of Protection

Critical Wavelength and similar in vitro methods primarily measure the broadness of UVA absorbance. They do not quantitatively measure the magnitude of protection. This has been illustrated in previous submissions to the docket that showed that two sunscreens with similar critical wavelengths could have very different UVA absorbance curves and thus provide different protection for consumers. The figure and table below (from reference 22) demonstrate that two formulations with the same SPF can have different absorption curves and very different levels of UVA protection. Similar findings from a recently conducted study confirm these observations and will be discussed below. To have a complete understanding of the UVA protection provided by a sunscreen product, both broadness of absorbance and magnitude of UVA protection must be assessed.



Monochromatic Protection Factor Curves of Two Prototype Formulations

Product Code	SPF (*in vivo*)	λ_c (nm)	$UVA_e PF$
4-A	7.5	379	10.2
4-B	7.4	372	5.2

From the above discussion these important points can be made:

1. A minimum 50% UVA efficacy (a PFA of 2) is appropriate for products below SPF 12 that wish to make basic UVA protection claims. Higher SPF products should contain correspondingly higher UVA protection levels to provide proportional UVA/UVB protection.

2. A sliding scale of minimum UVA efficacies can be proposed so that commensurate UVA protection is guaranteed at each SPF based on the PFA:SPF ratio of 0.20 (i.e., ensuring that a product provides proportionally balanced protection at every SPF).

3. In addition, a higher category of protection based on a higher ratio (PFA:SPF = 0.25) would assure that products which claim "extra" UVA protection on their labeling deliver that benefit from the perspective of both the magnitude of UVA protection as well as through the breadth of absorbance. For that higher classification, a minimum PFA of 3 would be required at SPFs below 12, with UVA protection rising with SPF.

4. Broadness of absorbance can be guaranteed for both the "basic" and "extra" levels of UVA protection through the requirement that all products that make UVA claims must demonstrate absorbance to or above 360 nm.

Testing of Formulations to Evaluate the Reproducibility of the Protection Factor A (PFA) and Persistent Pigment Darkening (PPD) UVA Test Methods, with Additional Assessment of Broadness of Absorbance

CTFA sponsored a study in which seven prototype products representing a wide variety of sunscreen formulation vehicles and active ingredients were used to test the reproducibility of the PFA (4) and PPD (19, 20) in vivo UVA test methods between laboratories. This test also served to compare the results obtained by using these methods to determine if the two methods could be used interchangeably to measure UVA protection. In addition, the formulas were evaluated to determine if they met the sunscreen monograph criterion of absorbing to or above 360 nm. The in vitro method used to assess the broadness of absorbance was the CTFA method previously submitted to the FDA in RPT 9 (1). The seven prototype products are provided in Appendix 1.

The protocols for the PFA and PPD (JCIA*) tests are provided in Appendices 2 and 3. In the PFA method, erythema from UVA is evaluated at 16-24 hr post-exposure. In the PPD (JCIA) method, persistent pigment darkening is assessed 2-4 hr post-exposure. Both methods utilize a xenon-arc solar simulator, filtered with a 3-mm WG335 filter, which includes both the UVA II (320-340 nm) and the UVA I (340-400 nm) (Figure 2A). The main difference in the two test methods (other than post-exposure results reading time) lies in the Skin Types of the subjects tested. Skin Types I, II and III are used for PFA; Skin Types II, III and IV are used for PPD. The biological response spectra for the in vivo test endpoints (erythema or pigment darkening/tanning) when tested with this light source are shown in Figure 2B.

* Japan Cosmetic Industry Association

Two laboratories conducted both the PFA and the PPD test procedures to determine the in vivo UVA protection provided by each of the seven prototype formulations. One laboratory included an evaluation of the persistent pigment darkening results (PPD) at 2, 3 and 4 hours post-exposure. Information on the testing laboratories that participated in this study is included with Appendix 1.

Two laboratories also assessed the broadness of absorbance using the Critical Wavelength method as submitted by CTFA in 1996 (1). One laboratory provided data on the critical wavelength both before and after sample pre-irradiation. The other laboratory provided data based both on the labeled SPF of the samples and on the "mean" (average) SPF of the formulations (however, no differences in critical wavelengths were observed).

Testing Results

The individual in vivo test data are provided in Appendices 4 and 5 for the PFA and PPD results, respectively. The data for the critical wavelengths determined are included in Appendix 6.

The data summary in Table 3 shows that for each sunscreen tested, the UVA protection values determined by the two in vivo test methods (PFA and PPD) were comparable, which confirms the results of earlier studies (11, 21). These data also demonstrate that clinical test methods for assessing UVA protection can be used to obtain reliable, reproducible results. Similar conclusions were made based on the multi-center study published on the PFA method by Cole (4). Comparison of the PFA results from the two laboratories and for the PPD results from the two laboratories are shown in Figures 3A and 3B. A comparison of the PPD results obtained at 2, 3 and 4 hours post exposure to the PFA data from the same laboratory is shown in Figure 4 and Table 4. The correlation of the PPD and PFA results for the seven products is shown in Figure 5.

Six of the seven products met the "broadness" criterion (i.e., absorbance $\geq$ 360 nm); however, they exhibited a large range of protection levels in vivo, as determined by the PFA and PPD methods. Only formula E, which contained 7% octyl methoxycinnamate with no added UVA absorber, did not provide a minimum UVA protection value of 2. Additionally, formula E did not exhibit absorption to or above 360 nm. These results are shown in Table 3, Figures 6A and 6B.

Based on the data provided, we suggest that the formulation for product A be used as a control formulation for UVA testing. This formulation is the same SPF 15 formulation submitted by CTFA as a "high SPF" control formulation for SPF testing (for which SPF data and methods validation have already been provided to FDA by CTFA, on 11/17/92 and 3/6/00 respectively).

Discussion

Six of the seven formulas would qualify for UVA labeling based on the criterion of absorbance to or beyond 360 nm, based on the proposed UVA protection classification system described in this document. Formula E did not qualify for UVA labeling based on the criterion of absorbance to or above 360 nm, nor did it meet the minimum UVA protection level (PFA or PPD) needed to fulfill the proportionality requirement for basic balanced protection, and thus would not qualify

for any UVA labeling under the proposed plan.

Formula A (SPF 15) would qualify as a product providing basic, proportional UVA protection, based on meeting the requirements of a PFA: SPF factor of 0.20, with absorbance to $\geq$ 360 nm. This formulation had a PFA or PPD value of 3 and absorbance to $\geq$360 nm.

Formula I (SPF 12) appears to be borderline. While it absorbs beyond 360 nm, the PFA values just barely meet the requirements (PFA of 2.4) for the basic level of UVA protection. The PPD results for this formula would not meet the requirement.

Formulas F, G, H and J would qualify as formulas that provide "extra" UVA protection at their SPF level based on the required ratio of a PFA: SPF factor of at least 0.25, as well as exhibiting absorbance to or above 360 nm.

The results (Figure 4) from the study on persistent pigment darkening (PPD/JCIA) which included reading of results at 2, 3 and 4 hr post-exposure show that the biological response is constant over that time period. While the standard time for reading PPD results is 2-4 hours post-exposure, the data show that this response appears to be very stable, and that PFA and PPD results are comparable. The data shown in Figures 3A and 3B illustrate that the differences between the two laboratories for each endpoint were also small, for both PFA and PPD.
A comparison of the in vivo UVA protection values to the in vitro broadness of absorbance (critical wavelength) shows that it is possible to create formulas with a range of SPFs which can provide significant amounts of UVA protection as measured by the magnitude of protection (PFA or PPD) and by broadness of absorbance. However, the data also show that it is not possible to predict the magnitude of UVA protection from either the SPF or from the broadness of absorbance (Critical Wavelength) at a specific SPF. As shown in Figures 7A and 7B, when comparing formula I and formula G (both SPF 12 formulations), we can see that formula G has a PFA or PPD value of 4 (blocks 75% of the UVA damage risk), while formula I has a PFA or PPD value of just over 2, which would block just over 50% of the UVA risk. Despite its zinc oxide content, Formula I falls slightly short in the PPD test for the minimum protection needed to provide proportional UVA/UVB protection at that SPF (i.e., it did not reach the required PPD: SPF factor of 0.20).

The data are also relevant to questions raised about the need to assess both the magnitude and the broadness of UVA protection. As shown above and in Table 3, it is apparent that two sunscreens with the same SPF can exhibit different levels of UVA protection. Therefore, the argument that PFA or PPD results are redundant with the information provided by the SPF is not accurate. This is also highlighted by Figure 2B, which shows that the predominant biological response of these in vivo test methods is due to the UVA I portion of the spectrum (340-400nm). This again illustrates that the proposed in vivo test methods do not solely test UVA II and therefore are not "redundant" with SPF test results.

It is not possible to predict the level of UVA protection from the SPF alone, or to predict the quantity of UVA protection solely from the broadness of the protection (see results for product I, above, and in Table 3). Comparing the level of protection using the results of either the PFA or

the PPD test method to the broadness of absorbance (as measured by Critical Wavelength) documents the absence of a correlation between broadness and magnitude of protection as both the SPF and Critical Wavelength values increase. This finding supports the recommendation of the American Academy of Dermatology, which concluded that measuring broadness alone is not sufficient to accurately describe product performance in the UVA.

Conclusions and Recommendations

1. SPF should retain preeminence on the principal display panel, and should continue to be the primary driver of consumer product selection. UVA labeling should also be displayed on the principal display panel in terms of simple text descriptors, using wording that will allow consumers to identify and select the sunscreen product with the level of SPF and UVA protection that suits their Skin Types and sun protection needs.

2. UVA protection claims should be allowed for sunscreen products with SPFs of 4 and higher. UVA protection should increase proportionally with higher SPFs, which can be assured through the use of defined ratios of SPF to PFA or PPD (see Table 2). A minimum of a PFA of 2 (blocks 50% of the UVA) should be a requirement even at low SPF levels (SPF < 12) for products that claim to protect against UVA as well as UVB.

3. Sunscreen products can be formulated to provide proportional UVA/UVB protection at each SPF level, or to exceed that requirement to provide increased UVA protection for those who want or need extra UVA protection. Therefore, two distinct categories of UVA protection are warranted.

4. "Broadness" of absorbance alone does not fully measure UVA protection or describe product performance in the UVA. A measure of the "quantity" of UVA protection provided by a product is needed in addition to an assessment of broadness of absorbance.

5. The PPD and PFA in vivo tests provide comparable results. Either method can produce reliable, reproducible data to measure the "quantity" of UVA protection. For practical purposes, having the option available of conducting testing for which the results can be read at 2-4 hours (PPD) or at 16-24 hours (PFA) may be important. For each product, the test method would be selected in advance; all testing for that formulation would be conducted using one method only. An advantage of the PFA method (4) is that it allows inclusion of Skin Type I subjects, who are those most in need of sun protection and who produce sunburn when exposed to UVA, whereas the PPD method can only be conducted on darker skin types, who produce pigmentation. The PPD test, however, may offer convenience for some laboratories, and with its acceptance as the Japan Cosmetic Industry Association (JCIA) method, may support ongoing efforts for global harmonization.

6. Voluntary professional labeling can be provided to physicians that will allow them to select or recommend sunscreen products for their patients' needs, based on more detailed information describing the quantity (protection factor) and the broadness of protection.

Communication of SPF and UVA Protection in Labeling

An example of the information contained on the principal display panel might include:

•SPF (and water resistance, as appropriate)

•UVA (select one of the following, as appropriate)
- "UVA protection" (meets minimum requirement for UVA/UVB proportionality and exhibits ≥360 nm absorbance)
- "Extra UVA protection" (exceeds minimum requirement for proportional UVA/UVB protection; exhibits absorbance ≥ 360 nm)

TABLE 1

AT EACH SPF: WHAT IS REQUIRED FOR PROPORTIONAL PROTECTION?

MEDs Incident	SPF Required	UVA MEDs	UVB MEDs	Minimum PFA Required
2	2	0.4	1.6	1
4	4	0.8	3.2	1
8	8	1.6	6.4	1.6
12	12	2.4	9.6	2.4
15	15	3	12	3
20	20	4	16	4
25	25	5	20	5
30	30	6	24	6
35	35	7	28	7
40	40	8	32	8
50	50	10	40	10

TABLE 2

Providing Proportional Protection:

Examples of UVA Protection Values at Increasing SPFs

SPF	UVA Protection PFA:SPF factor = 0.20		Extra UVA Protection PFA:SPF factor = 0.25	
	% UVA Blocked	Minimum PFA	% UVA Blocked	Minimum PFA
<12	50%	2	66%	3
12	60%	2.4	66%	3
15	66%	3	75%	4
25	80%	5	84%	6.25
30	83%	6	87%	7.5
40	88%	8	90%	10
45	89%	9	91%	11.25
50	90%	10	≥92%	≥12.5

TABLE 3

TEST VALUE COMPARISONS

Sample - Testing Lab	Active Ingredients, SPF	PPD (JCIA, ref. 20)	PFA (Cole, ref. 4)	Critical Wavelength (CTFA Method, ref. 1)
J - TKL	10% Octocrylene, 6% Oxybenzone, 5% Octyl Salicylate, 3% Avobenzone **SPF 30**	14.07	13.00	
J - CPT		10.80	12.19	379.6 nm
J - IMSI				380 nm
A- TKL	7% Padimate O, 3% Oxybenzone **SPF 15**	3.18	3.23	
A - CPT		3.24	3.70	360 nm
A - IMSI				362 nm
I - TKL	6% Octyl Methoxycinnamate, 4% Zinc Oxide **SPF 12**	2.18	2.59	
I - CPT		2.27	2.36	370.4 nm
I - IMSI				374 nm
G - TKL	7% Octyl Methoxycinnamate, 3% Avobenzone **SPF 12**	4.65	4.4	
G - CPT		3.88	4.73	376.8 nm
G - IMSI				379 nm
F - TKL	5% Oxybenzone **SPF 9**	2.95	3.43	
F - CPT		3.23	3.66	360 nm
F - IMSI				362 nm
E - TKL	7% Octyl Methoxycinnamate **SPF 8**	1.58	1.79	
E - CPT		1.72	1.75	336 nm
E - IMSI				355 nm
H - TKL	20% Zinc Oxide **SPF 4**	3.57	4.01	
H - CPT		3.98	4.34	380 nm
H - IMSI				381 nm

TABLE 4

COMPARISON OF MEAN PPD AND PFA VALUES FROM ONE LABORATORY

PRODUCT	2-HOUR PPD RESULT	3-HOUR PPD RESULT	4-HOUR PPD RESULT	16-24 HR PFA RESULT
A	3.24	3.16	>3.16*	3.61
E	1.72	1.60	1.64	<1.64*
F	3.23	3.06	3.06	3.66
G	3.88	3.78	3.86	4.73
H	3.98	4.35	4.43	4.34
I	2.27	2.27	2.31	2.36
J	10.8	10.8	10.57	12.2

*Data sets include 1-2 inexact values

REFERENCES

1. CTFA/NDMA taskforce report on Critical Wavelength determination for the evaluation of the UVA efficacy of sunscreen products. April 9, 1996. Docket 78N-0038, RPT 9.

2. Letter 167, Docket 78N-0038 to T.S. Elliott, April 8, 1999.

3. Letter 169, Docket 78N-0038 to T.S. Elliott, November 2, 1999.

4. Cole, C. Multicenter evaluation of sunscreen UVA protectiveness with the Protection Factor A test method. J Am Acad Dermatol 1994; 30; 729-736.

5. American Academy of Dermatology, Press Release April 20, 2000: available at "http://www.aad.org/PressReleases/futuresunscreen.html".

6. CTFA/NDMA. Sunscreen UVA Labeling, Market Research Study Report, Docket 78N-0038, February 6, 1996.

7. Food and Drug Administration. Sunscreen Drug Products for Over-the-Counter Human Use; Final Monograph; Extension of Effective Date; Reopening of Administrative Record. Fed. Reg. 65; 36319-36324, June 8, 2000.

8. Urbach F. Ultraviolet A transmission by modern sunscreens: is there a real risk? Photodermatol Photoimmunol Photomed 1993; 9; 237-241.

9. Diffey, Brian. Human exposure to ultraviolet radiation. Seminars in Dermatology 1990; 9; 2-10.

10. Fitzpatrick T. The validity and practicality of sun-reactive skin types I through IV. Arch Dermatol 1988; 124; 869-71.

11. Kaidbey K, Gange RW. Comparison of methods for assessing photoprotection against ultraviolet A in vivo. J Am Acad Dermatol 1987;16; 346-53.

12. Sayre RM, Agin PP. A method for the determination of UVA protection in normal skin. J Am Acad Dermatol 1990; 23; 429-40.

13. Kelfkens G, de Gruijl FR, van der Leun JC. Tumorigenesis by short-wave ultraviolet A. Carcinogenesis 1991; 12; 1377-1382.

14. Kligman LH, Sayre RM. An action spectrum for ultraviolet induced elastosis in hairless mice: quantification of elastosis by image analysis. Photochem Photobiol 1991; 53; 237-242.

15. Wulf HC, Poulsen T, Davies RE, Urbach F. Narrow band UV radiation and induction of dermal elastosis and skin cancer. Photodermatol 1989; 6; 44-51.

16. Lowe NJ, Meyers DP, Wieder JM, Luftman D, Bourget T, Lehman MD, Johnson AW, Scott IA. Low doses of repetitive UVA induce morphological changes in human skin. J Invest Dermatol 1995, 105; 739-743.

17. Lavker RM, Gerberick GF, Veres D, Irwin CJ, Kaidbey KH. Cumulative effects from repeated exposures to suberythemal doses of UVB and UVA in human skin. J Am Acad Dermatol 1995; 32; 53-62.

18. Honigsmann H. UVA and human skin. J Photochem Photobiol B: 1989; 4; 229.

19. Chardon A, Moyal D, Hourseau C. Persistent pigment darkening response as a method for evaluation of ultraviolet A protection assays. In: Lowe NJ, Shaath NA, Pathak MA, eds. Sunscreens: Development, Evaluation and Regulatory Aspects. New York, NY: Marcel Dekker, Inc. 559-582, 1997.

20. Japan Cosmetic Industry Association. Measurement Standards for UVA Protection Efficacy, 1998.

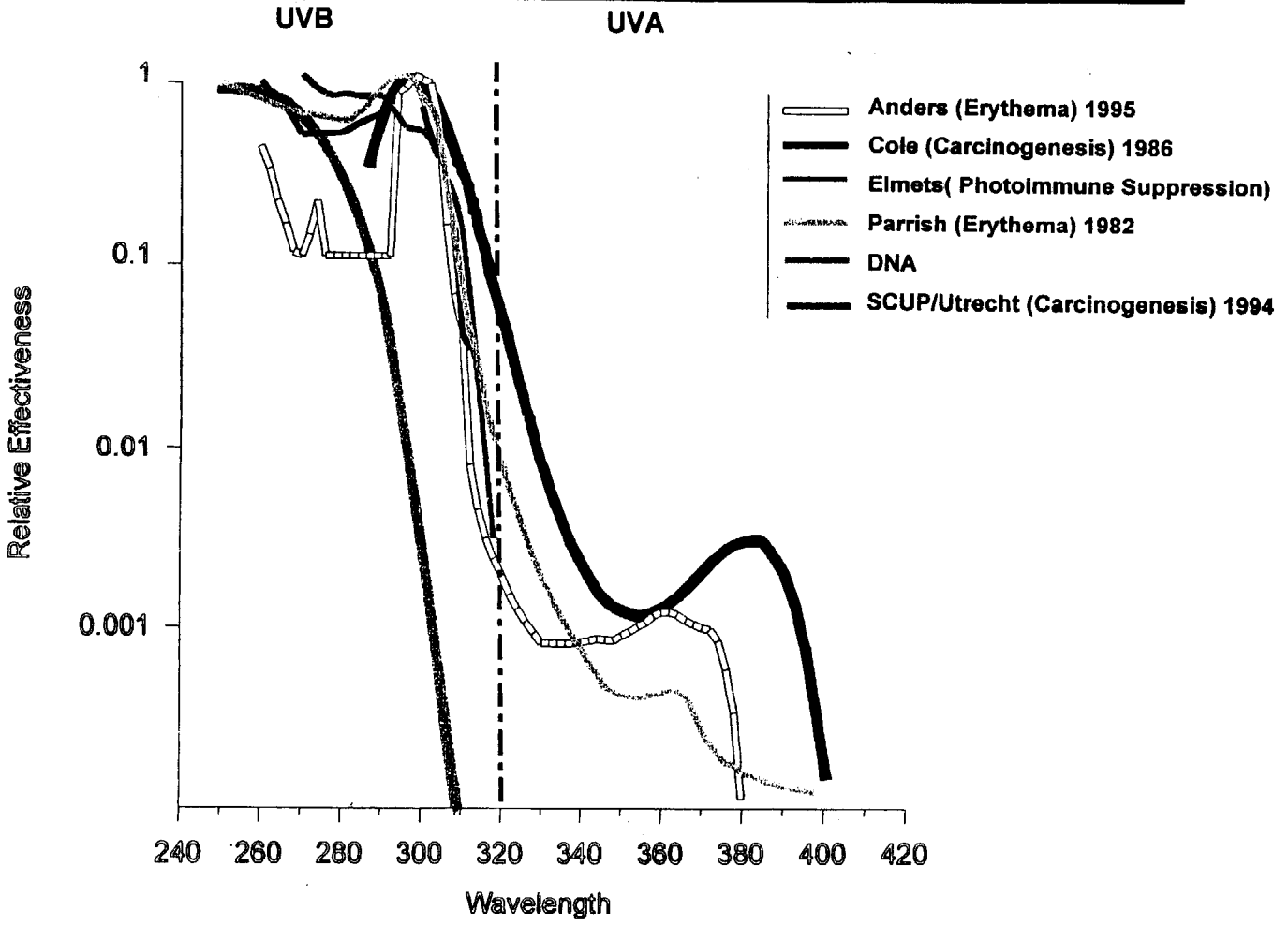
21. Stanfield JW, Edmonds SH, Agin PP. An evaluation of methods for measuring sunscreen UVA protection factors. In: Lowe NJ, Shaath NA, Pathak MA, eds. Sunscreens: Development, Evaluation and Regulatory Aspects, 2nd edition. Marcel Dekker, Inc., New York, NY, 537-557, 1997.

22. L'Oreal Research/Cosmair Cosmetics Corp. Comment C545, Docket 78N-0038, May 15, 1998.

23. Cole CA and Van Fossen R. Testing UVA Protective Agents in Man. In: Biological Responses to Ultraviolet A Radiation, F. Urbach, ed. Valdenmar Publishing Co., Overland Park, KS, 1992, pp. 335-345.

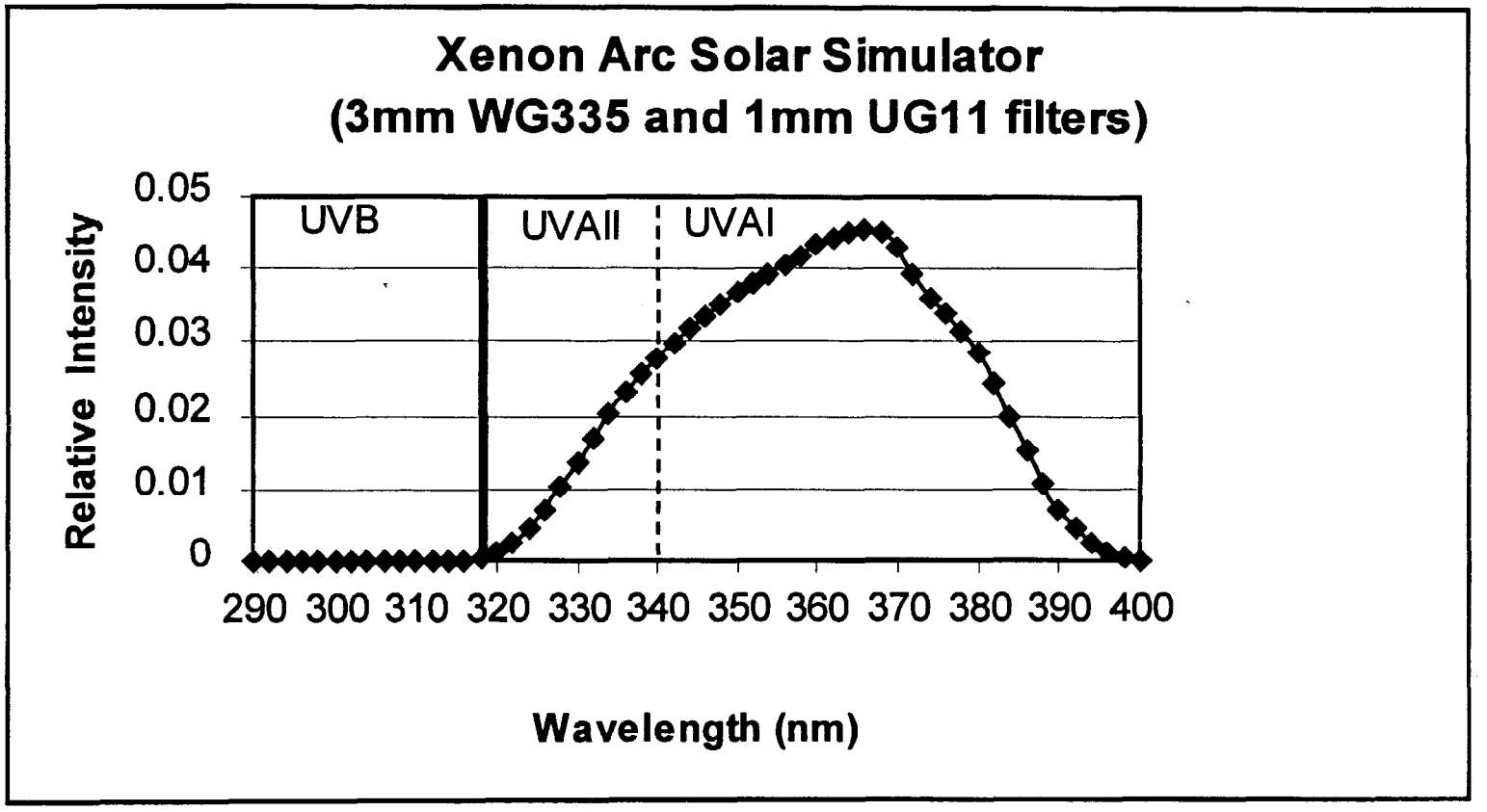
Figure 1

Comparison of UV Action Spectra



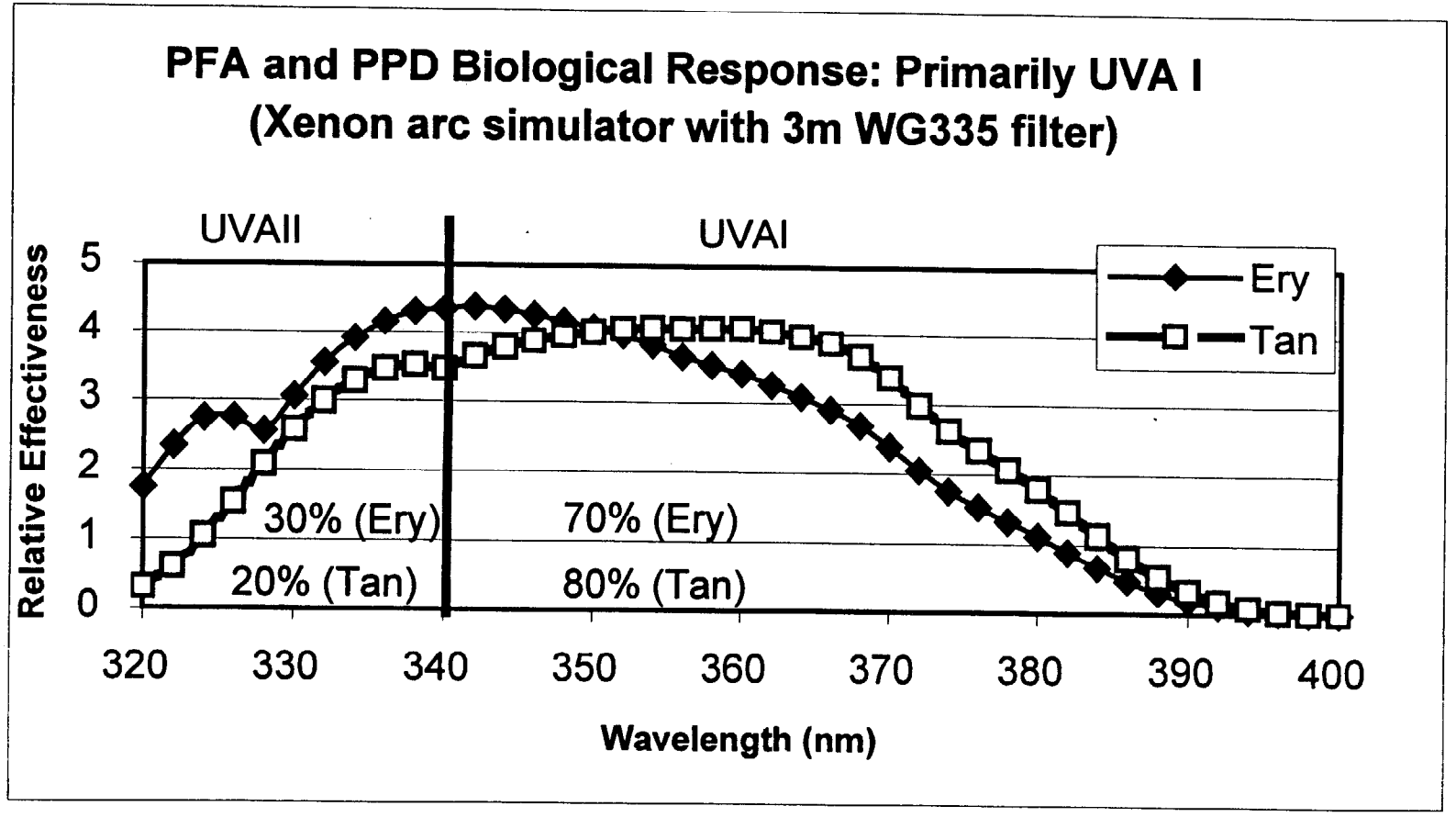
Based on the comparison of the action spectrum for sunburn to the action spectra for other known forms of UV damage shown above, it is important to include the effects of the shorter wave UVA as well as the longer wave UVA into any assessment of sunscreen UVA protection.

Figure 2A



Spectral distribution of the UVA source used in both the PFA and PPD test methods. Less than 2% of the biological response results from the UVB contained in the source.

Figure 2B



The action spectra for erythema (ery ◆) (CIE) and for Persistent Pigment Darkening (tan ❑), when cross multiplied with the WG335 3mm filtered xenon arc solar simulator, clearly show that the predominant biological response is due to the UVA I portion of the spectrum (340-400nm). This illustrates that the proposed in vivo test methods do not solely test UVA II and therefore are not "redundant" with SPF test results.

Figure 3A: Comparison of Mean PFA Results From Two Laboratories

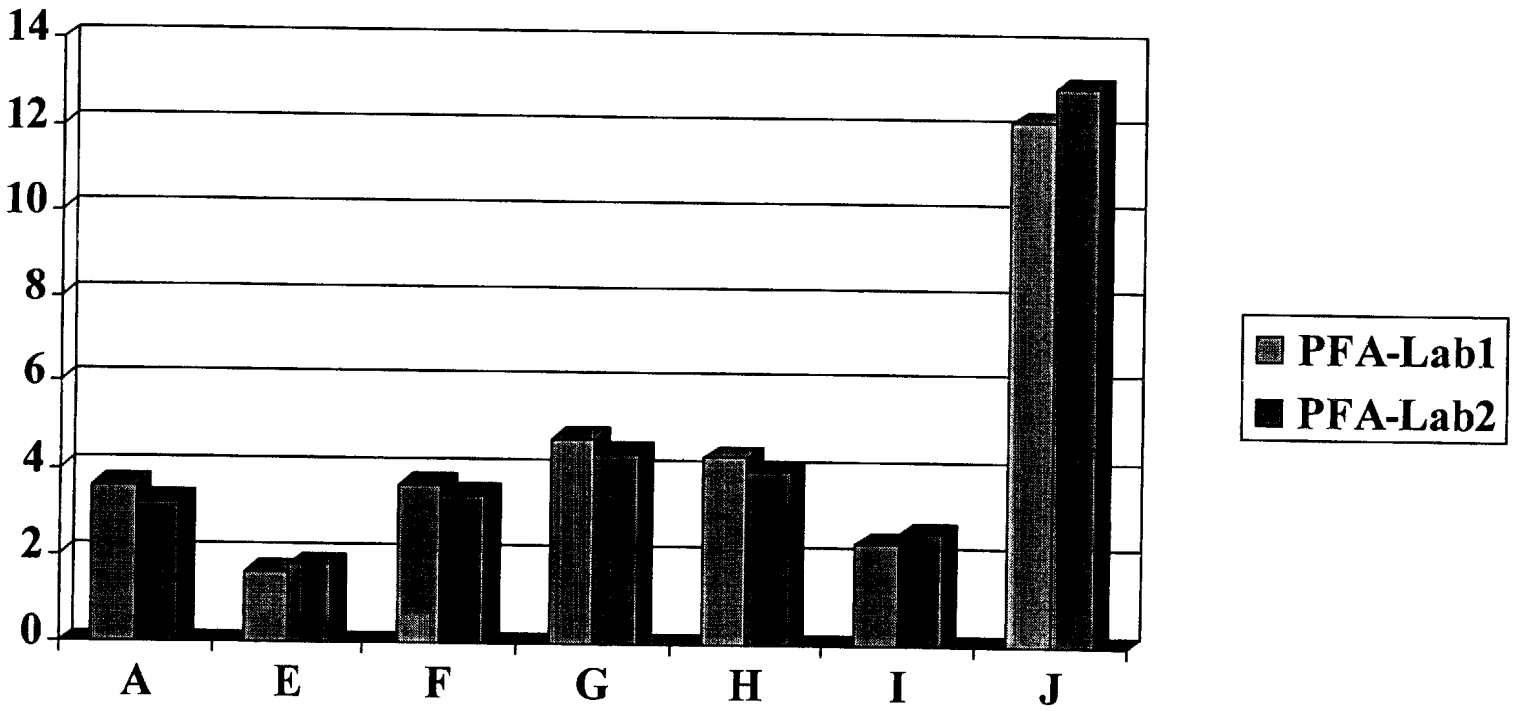


Figure 3B: Comparison of Mean PPD Results From Two Laboratories

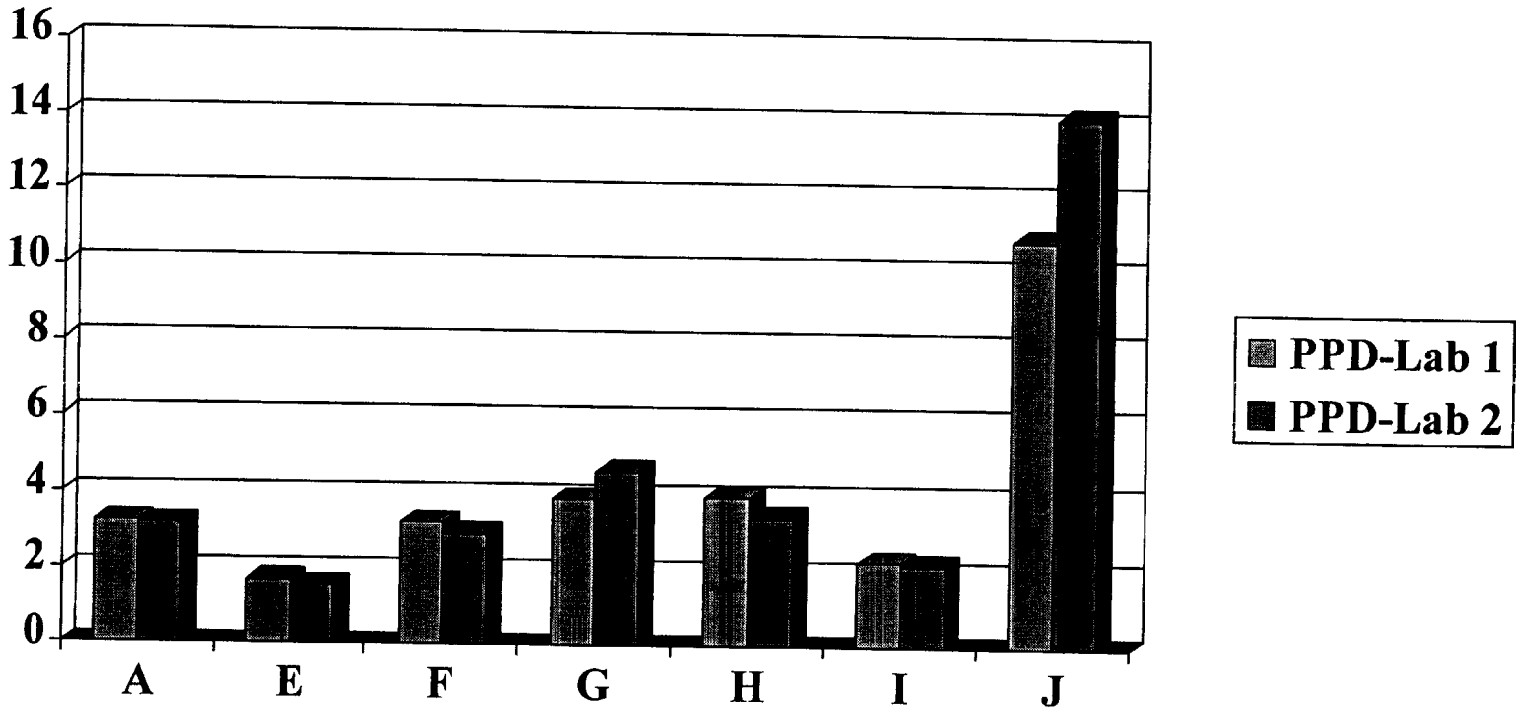


Figure 4: Comparison of Mean PPD and PFA Values From One Laboratory

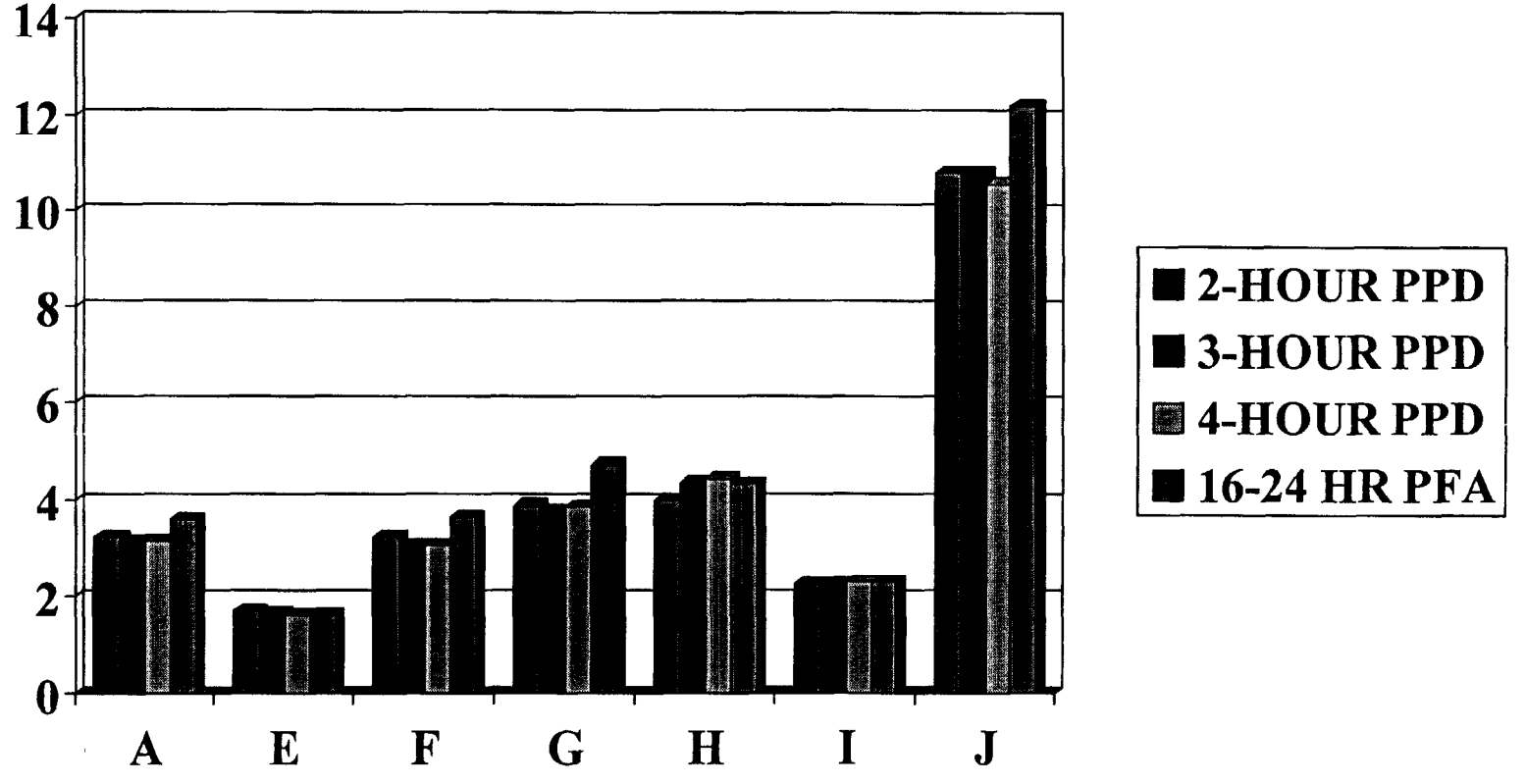


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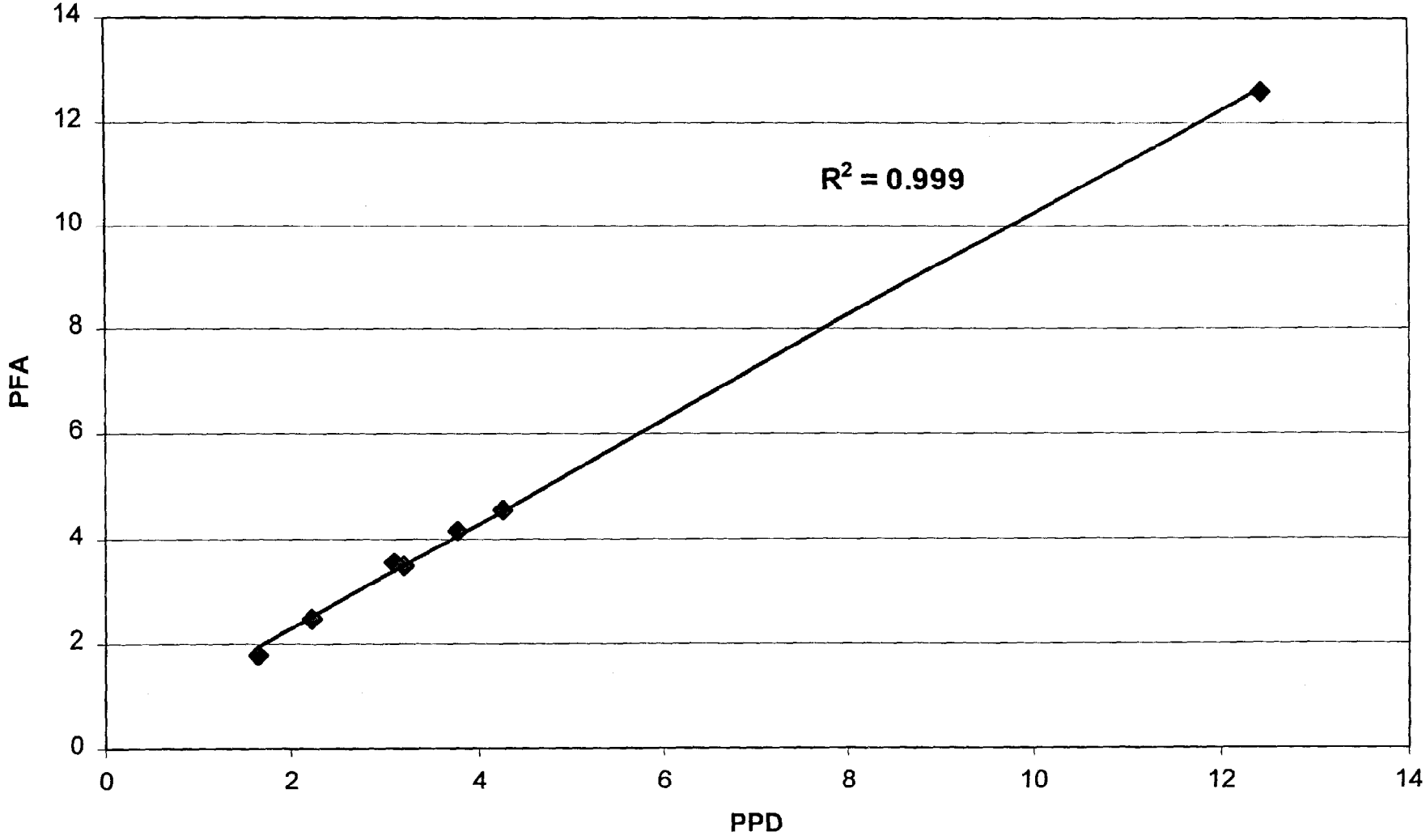
Figure 5: Correlation between Mean PPD and PFA Values



For each sunscreen tested, the PPD and PFA in vivo tests provided comparable results. These two in vivo methods can be used interchangeably to produce reliable data to measure the "quantity" of UVA protection.

Figure 6A

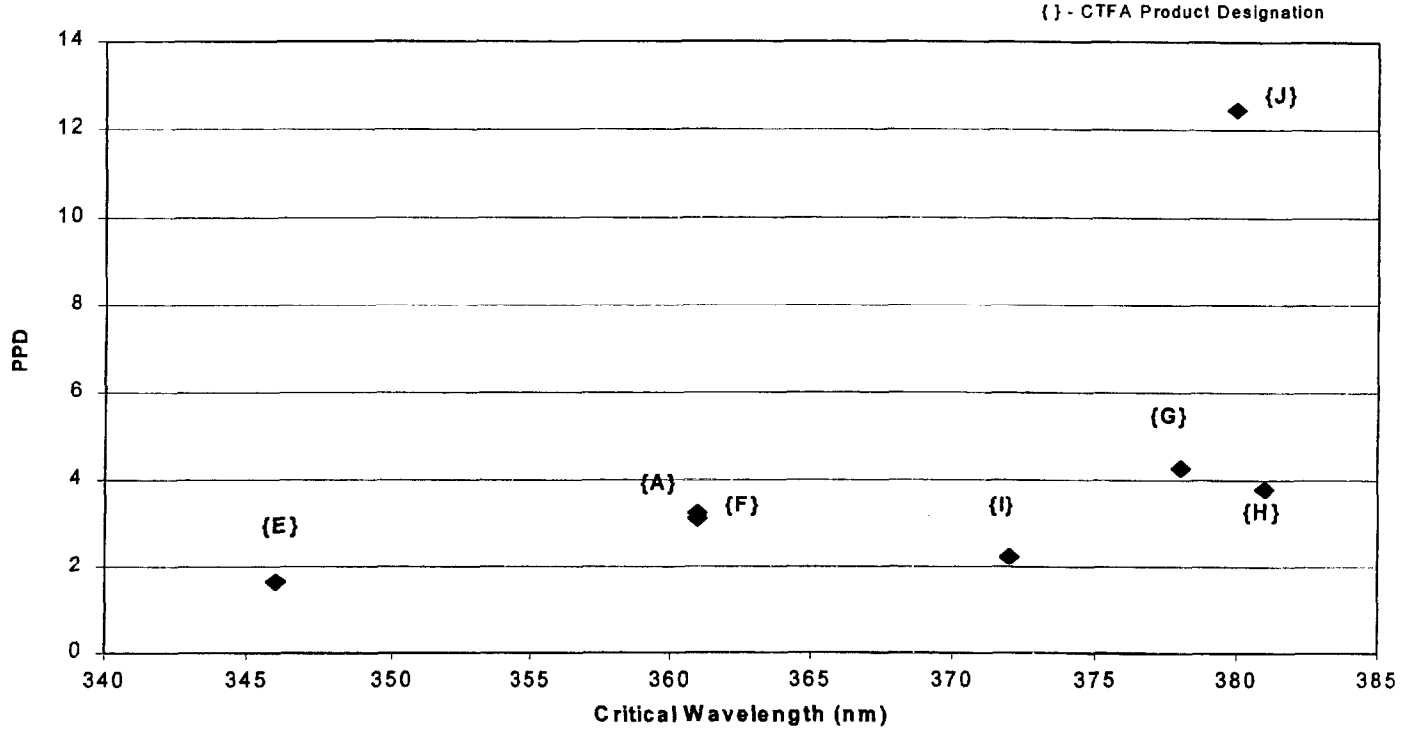
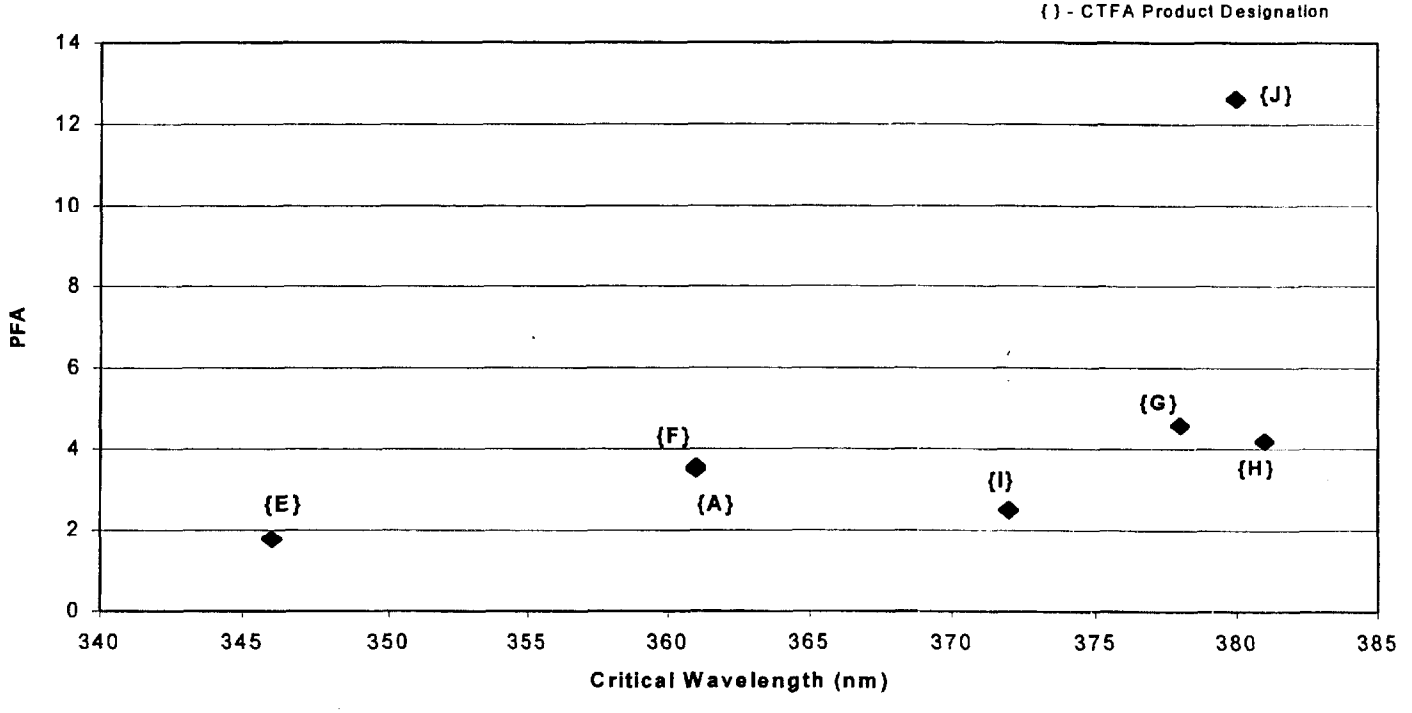


Figure 6B



"Broadness" of absorbance alone (as measured by Critical Wavelength) does not measure the quantity of UVA protection or fully describe sunscreen product performance in the UVA.

Figure 7 A

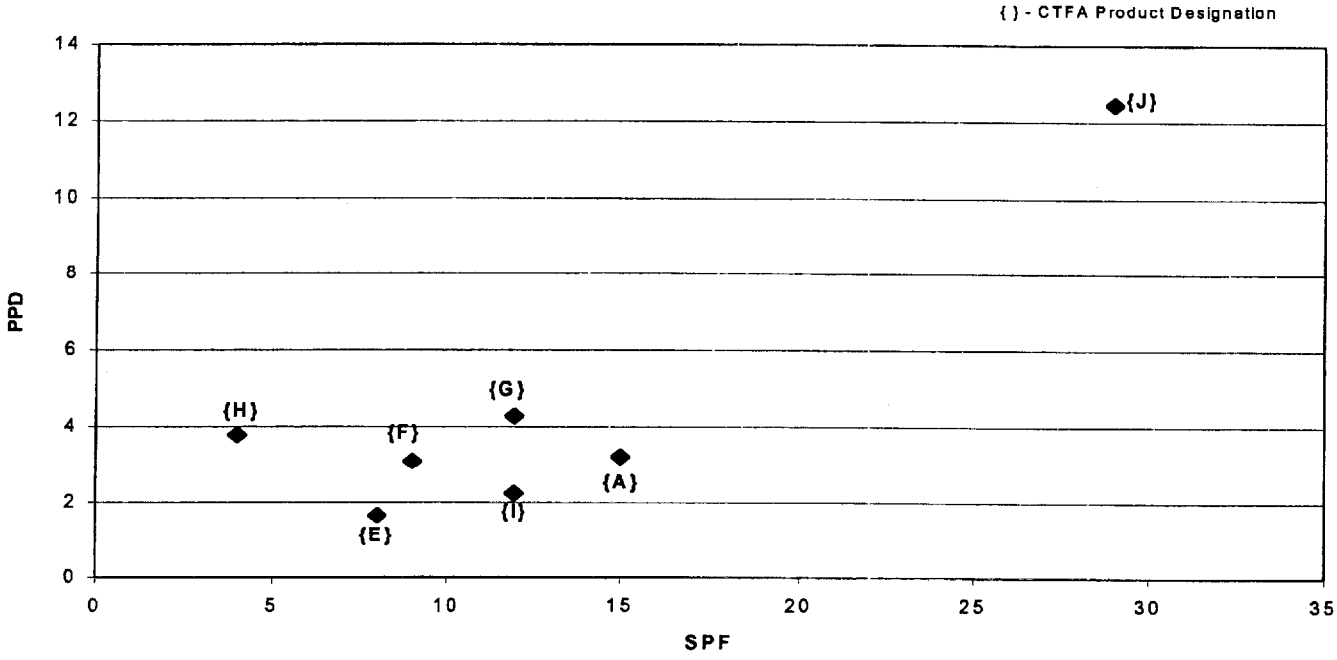
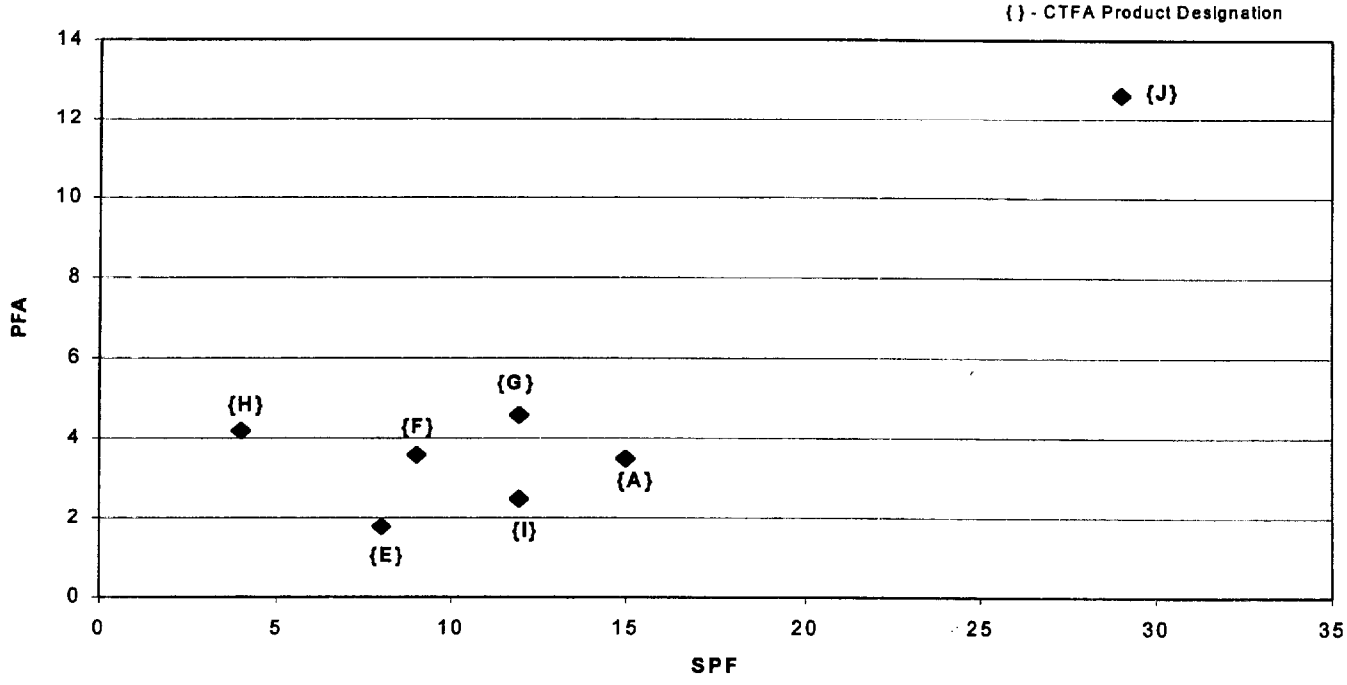


Figure 7 B



Sunscreens with the same SPF can exhibit different levels of UVA protection. Therefore, the argument that PFA or PPD results are redundant with the information provided by the SPF is not correct.